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# Informality and Protection from Health Shocks

Lessons from Yemen

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## Abstract

The informal sector is generally believed to be more vulnerable to various risks due to limited access to social insurance, but little empirical evidence exists to support this statement. This paper examines the relationship between informality and protection from health risks in Yemen. The formal sector, when defined based on pension coverage, largely overlaps with public employment where the better educated, more experienced, and better informed tend to work. The results indicate that, even after accounting for socio-economic status, water supply and quality conditions,

risky behavior patterns, and unobserved heterogeneity, formal sector households have better accessibility and affordability to health service. This may in part explain better health outcomes among formal households, although large heterogeneity across regions (urban/rural) exists. However, the role of the existing health insurance is found to be unclear. The findings reconfirm the importance of policies that promote universal access to health service and a risk pooling avenue delinked from employment types as well as healthy living conditions and lifestyles.

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**Informality and Protection from Health Shocks:  
Lessons from Yemen**

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## 1. Introduction

Informal sector workers are arguably believed to be less protected from various risks than their formal sector counterparts for several reasons.<sup>2</sup> This is primarily because the informal sector largely overlaps with low quality jobs where the workers, often less educated and low skilled, tend to work with little legal or social protection linked to their work status such as social insurance.<sup>3</sup> In addition, informality may have implications on the ability to hedge risks due to limited self-insurance and self-protection. Informal sector workers, more likely to live in poverty and face liquidity constraints, have few options on the choice of inter-temporal savings and dissavings for self-insurance. They may be less risk averse and more likely to engage in risky behavior with little self-protection, as they perceive their opportunity costs little due to low earnings potential.

Little evidence exists, however, whether and to what extent informal sector is more vulnerable than formal sector. An increasing number of studies emphasize that informality does not necessarily imply the vulnerability of workers. Some highly productive and well informed workers often choose to work in the informal sector.<sup>4</sup> Seemingly larger exposure to risks for some less educated, less skilled workers in the informal sector, who are more likely to live in poverty, may not be necessarily due to informality. Moreover, informal sector workers may have better access to informal safety nets through family and community members they work with. Therefore, the vulnerability of the informal sector is theoretically and empirically unclear.

Thus what measures are needed to provide the informal sector with adequate protection, without disfavoring formal sector and creating distortive incentives, is subject to debate. This is

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<sup>2</sup> These risks include job loss (e.g., sudden layoff, bad weather for crops, or economic crisis), health shocks (e.g., accident or disease), longevity (e.g., outliving accumulated wealth) and the resulting income losses.

<sup>3</sup> This includes supplementary income provision in response to job losses (e.g., unemployment insurance), health shocks (e.g., health insurance) and consequent human capital loss (e.g., disability benefits), and old-age poverty (e.g., pension).

<sup>4</sup> See, for example, Maloney (2004), Perry et al. (2007) and Schneider and Enste (2000).

particularly true when social insurance programs, even for formal sector workers, do not properly function or provide adequate protection. Self-insurance may be equally difficult regardless of the sector due to credit constraints and myopia. If family members' vulnerability to risks in the informal sector stems from limited access to social insurance, protection, or information, measures need to be taken to delink social insurance and relevant information from the work sector and expand insurance coverage and accessibility. However, if informal sector is no more vulnerable than formal sector due to other informal safety net, the welfare gain from expanding social insurance may be small.

This paper investigates the informal households' vulnerability using Yemen's Household Budget Survey focusing on health.<sup>5</sup> Health is a critical determinant of household well-being, especially in low income countries like Yemen where labor and human capital is usually the main source of income.<sup>6</sup> Using a unique data set that includes information on labor market activities and health variables, this paper investigates whether Yemenis' health, access to care, and burden of health spending systematically differ by employment sector, and if so, the underlying reasons for these differences. This paper contributes to a better understanding of informality and its implications on household welfare in health in Yemen.

Informality in this study is defined based on access to social insurance.<sup>7</sup> Wage employed workers provided with pension or health insurance or both are formal, whereas workers without access to social insurance coverage are informal. Among the formal wage employed, those with both health and pension coverage are separately categorized with those with pension coverage only, as the role of health insurance in health outcomes is also of interest. Informal workers include the wage

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<sup>5</sup> Ideally, in order to investigate households' vulnerability to external shock, one needs panel data to track the same individuals or households, showing how their consumption, investment in health and education, or their labor market behavior change in response to the shock. The analysis sets aside these important dimensions of household welfare due to data availability. This area would be a subject for future research.

<sup>6</sup> Note that Yemen is one of the poorest countries in the Middle East and North Africa Region with about 1,000 dollars GNI(Gross National Income) per capita.

<sup>7</sup> This is in line with many other studies that defined informality based on protection through social security. See Portes, Blitzner, and Curtis (1986), Marcoullier et al. (1997), and Saavedra and Chong (1999).

employed and the self-employed with no access to any social insurance. In order to consider unobserved characteristics that affect employment type, a selection corrected model is estimated.

The findings are as follows: in general, formal households have better outcomes in health than the informal households, although there is large heterogeneity especially between urban and rural areas. The better outcomes among formal households may be related to the better and affordable access to health service, especially among those with health insurance. The differences in outcomes, though in large part due to their different observable characteristics, persist even for observationally identical individuals. Health and nutrition outcomes confirm the importance of good water conditions and healthy practice of breastfeeding and abstaining from smoking and qat chewing. The role of existing health insurance is not clear, although it may have increased access and utilization of health service. Households rely largely on informal safety net to cope with health burden due to disability of household member. These findings suggest that policies should primarily aim to promote healthy living conditions and lifestyle, and provide risk pooling and saving avenue regardless of their employment type.

The paper is organized as follows. Section 2 provides a review of concepts and issues related to informality. Section 3 describes the data and institutional background regarding health protection in Yemen. Section 4 and 5 presents a descriptive analysis and the empirical strategy, respectively. Section 6 discusses the results on implications of informality on health outcomes. Section 7 and 8 further investigate potential explanations regarding the results presented in Section 6. Finally, section 9 summarizes and concludes the study.

## **2. Informality and Health Shocks**

A large body of literature on informality often has examined its definition, size, and determinants and consequences, but suggested no conclusive views. Little consensus exists, and informality is often characterized as mixture of lax regulation, an absence of records and taxation, and a large presence of

unprotected, low-skilled workers.<sup>8</sup> Studies often take an either side of enterprises or workers to examine the implications of informality. From the enterprises' perspective, studies highlight various incentives to enter the informal sector, including excessive tax rates, a high degree of regulation, and social insurance contribution, and examine the impacts of these on firms' productivity. More relevant for this paper, studies examining informality from workers' perspective often emphasize their productivity and protection gap.<sup>9</sup>

Informal sector workers or enterprises, however, are not monolithic, but in fact, a heterogeneous group exhibiting a wide range of variation. They are in general characterized as less educated, less skilled, and from low income families, who often have no choice but to work in informal sector and tend to have low earnings.<sup>10</sup> Several studies, however, challenge the notion that informal employment only entails low quality jobs where workers with no other employment options are forced to participate in. Marcoullier et al. (1997), for example, examine the wage premium of the formal over informal sector in Mexico, El Salvador, and Peru. Informal workers are defined based on the enterprise size or social security coverage. They found a positive wage premium for work in the formal sector in El Salvador and Peru, but not in Mexico. Maloney (2004) and Perry et al. (2010) in particular emphasize the voluntary exit of workers from the formal sector to take advantage of lower business costs as well as an exclusion aspect. Bosch and Maloney (2008) also find a heterogeneous

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<sup>8</sup> In addition to the mentioned dimension of informality, there are studies that treated informality as hidden or illegal economies. For example, see Frey, Weck, and Pommerehne (1982), Cassel and Cichy (1986), and Schneider and Enste (2000) for informality as a hidden economic activities; Friedman et al. (2000) as unofficial activity; Pyle (1989) and Thomas (1999) as illegal economy. Depending on the scope of coverage, the size of informality varies widely. See Tanzi, (1999), Thomas (1999), and Giles (1999) for discussion on the size of informal sector.

<sup>9</sup> The definition of informality adopted from the International Labor Organization (ILO) is as follows. The informal sector is broadly characterised as consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations - where they exist - are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees.

<sup>10</sup> Many studies examined characteristics of formal and informal sector workers in countries in the Latin America and Caribbean region, but few studies are available for the characteristics of informality in the Middle East and North Africa region. For example, Funkhouser (1999) for 5 Central American countries, Bargain and Kwenda (2010) for Mexico, Brazil, and South Africa, and Gindling (1991) in Costa Rica, Marcoullier et al. (1997) for Mexico, El Salvador, and Peru.

nature of the informal sector where some self-employed enter the market during economic expansion while displaced workers would rather work in the informal sector than stay unemployed during the economic downturns.

There is little definite evidence as to whether informal workers are less protected from poverty induced by external shocks. It is widely accepted though that informal sector likely has limited access to risk pooling and savings vehicles, and is less protected from income loss induced by shocks. Most social insurances such as pension, unemployment benefits, and health insurance are only provided to formal sector employees. Not having access to social insurance reduces risk pooling and savings options to insure against risks (Gertler and Gruber, 2002). However, the causal relationship between informal sector employment and vulnerability is unclear. Extra income accumulated from non-payment of taxes, and the use of informal safety nets present in the informal economy may reduce vulnerability of informal sector.<sup>11</sup> Some studies have found that the informal sector serves as an informal safety net for the poor (Ferman, Henry and Hoyman, 1987). The informal sector also provides employment opportunities for workers in transit and marginalized workers such as women (Carneiro et al. 2008). Gulyani and Talukdar (2010) found that informal activities, including micro enterprises, actually helped alleviate poverty.

Little is known about the implications of informality or lack of health insurance on health. If health is produced with individuals' decision of investment in preventive and curative health services, as in Grossman (1972), limited access to service would result in poor health. Given that health risks are least predictable and quite sizeable, the lack of insurance to hedge against the risks would limit adequate investment in health. Findings that the poor are less well-insured against income risks suggest that informal households are also less-well insured as they tend to be poorer (Jalan and Ravallion, 1996). Baeza and Packard (2006) note that large scale risk pooling can greatly mitigate the

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<sup>11</sup> See Richard J. Cebula (1997), for the impact of the income tax rates on labor supply across formal and informal sector.



risk of income losses due to health shocks. However, health insurance often fails to cover informal sector and, even among formal sector, the coverage can be very low due to low enrollment (Wagstaff, 2009). Thus little is known about the extent to which health insurance reduces vulnerability to the health shocks.

### **3. Data and Institutional Background**

#### Data

This study uses a nationally representative Yemen Household Budget Survey (HBS) conducted in 2006. In examining health risks by work status, the data should contain information on both health and labor market outcomes. The wealth of information on health as well as individual demographic and socio-economic characteristics, labor market indicators, and household living conditions, income, and expenditure enable to analyze the health implications of informality.<sup>12</sup>

The Yemen HBS collected information on 13,121 households and 98,845 individuals. Among 56,600 adults aged fifteen or above, 20,888 individuals are working as either wage employed or self-employed.<sup>13</sup> For all workers, the data contain information on job duration for the current occupation, the total number of jobs held, and an indicator of agriculture sector. In addition to this, wage workers are asked about social insurance coverage, benefits such as paid leaves, and earnings and working hours are included. For the self-employed, the information on the size of enterprises and rough measures of revenue and costs are collected.

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<sup>12</sup> A Labor Force Survey includes detailed information on labor market indicators including employment status and sector, job search efforts, and earnings, but often lacks information on health. On the other hand, Demographic Health Survey has detailed information on health, but misses labor market indicators.

<sup>13</sup> Among those not working, it is unclear whether they are still in the job search process. Thus, defining an economically active population using a standard definition is not possible here. The majority of non-working adults are either women or students.

The data contain nutrition and health information for children under six, health and service use information for adults, and health spending for households. Children's nutrition measures, such as underweight and stunting, are constructed using objective measures of weight and height. Health measures include self-reported disability and chronic diseases, illness, and accidents. Health care service information includes each child's immunization, assisted child delivery, and regular health checkups with health professionals.<sup>14</sup>

### Health and Health Care in Yemen

The most serious health problem faced by Yemenis is women and children's health, where the achievement of Millennium Development Goals (MDGs) proves challenging. Child malnutrition is strikingly prevalent in Yemen where more than half of children under five suffer from malnutrition.<sup>15</sup> This is among the world's highest child malnutrition rate along with Iraq and Sudan. Progress towards reducing the child malnutrition rate by half has been slow. The maternal mortality rate, 365 deaths per 100,000 lives, is the highest among the Middle East and North Africa (MENA) region countries.<sup>16</sup>

While health indicators in Yemen pose a serious problem, access to health services are low, and services for major treatments are prohibitively expensive. The government, Ministry of Public Health and Population (MOPHP), is the main health service provider in Yemen. They operate a three-tier network of primary, secondary, and tertiary level facilities through governorate and district health offices. One of the major challenges of the Yemeni health system is low coverage among the population. Furthermore, large discrepancies exist in levels of coverage between urban and rural areas (Fairbank, 2009). Due to the limited delivery of health services, particularly in rural areas where

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<sup>14</sup> World Bank (2007) noted that the questionnaire of HBS 2005 did not clearly distinguish if the question meant to ask about delivery by a doctor, midwife or a medically trained professional.

<sup>15</sup> See UNICEF (2006).

<sup>16</sup> See World Bank (2009).

approximately three-fourths of the population are concentrated, Yemenis face challenges in achieving maternal and child health related Millennium Development Goals (MDGs).<sup>17</sup>

In addition to the lack of health service delivery, an underinstitutionalized financial payment system presents another barrier to health care in Yemen. Since there is no existing health insurance scheme in Yemen, health expenditures mostly come from out-of-pocket payment. While public health spending from MOPHP provided service comprises 1.8% of GDP, private out-of-pocket expenditure is about two times larger at 3.4% of GDP (Fairbank, 2009). Only a slight proportion of government workers receive reimbursement for utilized health services. Even out-of-pocket expenditures, however, are a concern to those who have access to health services. Since a large proportion of the population has limited access to service, the out-of-pocket expenditure generally occurs only to the well-off or the severely ill. Households with disabled or chronically ill members are exposed to large losses in income, but there is no risk pooling instrument available in Yemen.

#### **4. Descriptive Analysis**

Health outcomes may vary across individuals due to differences in (i) resources available for investment in health; (ii) living conditions including water and sanitation environment; (iii) risky behavioral patterns; and (iv) unobserved preferences or information. In order to capture these differences, the characteristics of formal and informal workers and households by employment status are presented below.

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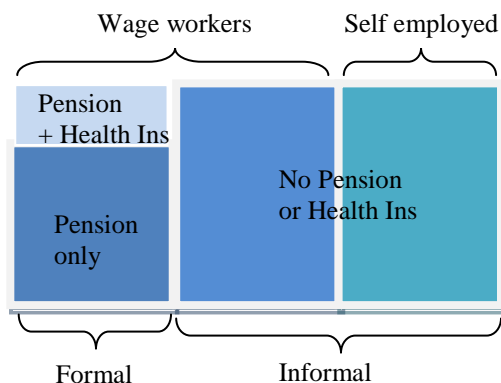
<sup>17</sup> For example, MDGs 4 and 5 are not likely to be met in Yemen. MDG 4: Reducing child mortality and morbidity and MDG 5: Improving maternal health.

### Characteristics of Workers, Jobs, and Households by Employment Type

Recall that among all employed workers, those who are wage employed and provided with a pension are categorized as formal workers; other wage workers and the self-employed are categorized as informal workers (See Figure 1). That is health insured workers ( $H$ ) and pension only workers ( $P$ ) compose formal sector workers, while wage workers without social insurance ( $N$ ) and the self-employed ( $S$ ) compose informal sector workers. Among formal workers, a small fraction reported employer provided health insurance, although no other information such as their contribution, coverage, and reimbursement from insurance is available.

Table 1 reports workers, jobs, and households' characteristics by employment type and locality of residence. The first row of the table shows the distribution of each type of workers. About 25 percent of working individuals are formal, among whom 28 percent are covered by health insurance. The share of formal sector is higher in urban than rural areas: about a half of formal workers reside in urban areas, whereas slightly more than 20 percent of informal workers reside in urban areas.

Figure 1. Category of workers:  
by employment status and social insurance coverage



There are clear differences in demographic characteristics across different types of workers (Panel A of table 1). Several of these differences are more striking in urban than rural areas. The majority of workers, especially informal and rural ones, is male, reflecting a very limited work opportunities for Yemeni women. The self employed tend to be older than other groups, whereas the informal wage workers are the youngest. Formal workers are significantly more educated with more than half having received tertiary education. On the other hand, self-employed workers are the least educated group; about half (51%) have no schooling.<sup>18</sup> Educational attainment is a lot higher in urban areas, and the urban/rural educational gap is particularly larger for informal wage workers. Self-employed workers tend to have larger families with more children, partly because they are older. The indicator of “born here” informing the mobility of labor shows that the labor in rural areas is static with little move. Urban areas relative to rural witnesses more labor mobility: the self-employed are most likely to be born in the current village, while the health insured formal workers are the least likely group.

Panel B reports job characteristics of these workers. Informal workers include a large share of agriculture, particularly among the self employed and rural workers, whereas only a negligible proportion of workers in formal sector work in agriculture. Formal sector largely overlaps with public sector: the proportion of public workers among formal workers is 97 percent, and the proportion of formal workers among public workers is 89 percent. When the number of jobs was inquired, a substantial proportion of workers, especially wage workers, hold more than one job, and this is more evident in rural areas.<sup>19</sup>

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<sup>18</sup> Social network is very important in seeking job opportunities. About one third of respondents answered that they find about jobs through friends and relatives, and about a quarter directly ask employers. Only a small portion of people seek jobs through an official channel such as labor office. More educated people may have more information on formal sector jobs through this social network.

<sup>19</sup> It is well known that formal or public sector workers often have side jobs other than their main occupation, as their salary is lower than private sector.

There exist noticeable differences in earnings and hours of work as well as benefits among the wage employed. Informal wage employees *N*, mostly in the private sector, have little access to the benefits like paid leaves or health insurance and work longer hours, although their earnings are higher or comparable to the formal sector workers.<sup>20</sup> Workers of *P* have lower earnings with shorter hours of work, even though their education and work experience are comparable relative to their counterparts with health insurance. The gap in hours and earnings across different types is slightly larger in urban areas than the rural.

Some households' characteristics including their living conditions and income are presented (Panel C in table 1). The indicator of pensioner in the household shows a positive intergenerational correlation in formal sector working, as current formal worker households are more likely to have pensioners in the household. Living conditions measured by water supply and quality reveals substantial variation across types and between areas. A subjective measure of enough water supply indicates no systematic disparity between formal and informal households, as type *H* and *P* households offset each other for the average to be similar to that of the informal households. To the contrary, more objective measures indicating inside water supply and water treatment suggests that there is a significant gap in access and quality of water between formal and informal households, especially in urban areas. It is also striking that rural areas are significantly behind in water supply and quality than urban areas.

About 65 percent of workers reported that their households have extra income other than his labor earnings, including public and private transfers and interest income. The amount of extra income is highest for the *S*, followed by *P*, and least for the *N* and *H*.<sup>21</sup> When income quintile is obtained based on nonfood consumption level, which supposedly reflects total household income including

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<sup>20</sup> Their monthly earnings were calculated based solely on their main occupations. Other labor earnings from non main jobs were not included here. The earnings information among the self employed were not very clear in their revenue, profits, and costs of enterprises, and omitted here.

<sup>21</sup> It is not very clear from the data whether the extra income includes labor earnings from non-main occupations.

labor earnings and other transfers, a large urban/rural and formal/informal income discrepancies emerge: less than six percent of urban formal sector belongs to the lowest quintiles in contrast with the 20 percent of rural counterparts; in both urban and rural, formal workers are better off in income distribution than the informal workers; rural formal workers are more likely to fall on lower end of income distribution than the urban informal.

### Health Outcomes, Access, and Expenditure

Having examined individuals and households' characteristics by employment type and locality, I move over to the health dimensions focusing on health indicators, access to service, and expenditure (See table 2). Health outcomes examined here include indicators of malnutrition for children and illness for adults.<sup>22</sup> Access to health service is measured with indicators of assisted delivery, medical help when sick, and child immunization. Financial burden due to health spending is measured as per capita health expenditure, indicators of catastrophic expenditure, and proportion of health spending out of total expenditure.<sup>23</sup>

Child health and nutrition outcomes reconfirm the serious situation in Yemen. A significant proportion of children are severely stunted, and the incidence of underweight and illness is also high. Nutrition outcomes are slightly better for children in formal sector households and the difference is clearer for urban children. Nutrition outcomes do not necessarily go with the health outcomes: Nutrition status is better among urban children, while health outcomes are better for rural children. The outcomes of formal households with health insurance are no better or often worse than those of

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<sup>22</sup> Children's malnutrition is captured by severe stunting and underweight for those below age six. Illness is defined to be one if the person has disability or chronic disease, nonchronic diseases, or accidents.

<sup>23</sup> Catastrophic expenditure is defined to be one when the proportion of health expenditure out of nonfood consumption exceeds 10 and 20 percent. Caution is needed to normatively interpret the indicator of catastrophic expenditure. It is certainly burdensome to have a large proportion of income spent on health, but it is also important to have adequate investment in human capital.

formal households without health insurance. Almost one woman out of five has some disability, illness or accidents in urban areas. Women's illness is less prevalent in rural areas.

Health care service is best accessible by both types of formal households, with slightly better outcomes for  $H$  than  $P$  in some cases, and the self-employed ( $S$ ) have similar or slightly better access than informal wage employed workers. Access to care widely varies across urban and rural region, particularly in assisted delivery. The likelihood of receiving medical help when falling ill is surprisingly high. Child immunization indicates immunization for all of listed diseases including tuberculosis, polio, DTP, measles, and hepatitis-B, and the proportion of children who received all varies from 37 percent among rural informal wage worker families to 60 percent in urban formal households.

Per capita expenditure on health, probably reflecting household income level, is highest among formal and lowest among informal wage employed workers. When it comes to the share of health expenditure out of the total household expenditure, the share in informal households seem to be slightly higher than that of formal households. The incidence of catastrophic expenditure also shows a similar story.

## **5. Selectivity Corrected Model**

There are three potential explanations why health related outcomes are different across different employment types. First, workers and their households' observed characteristics that may affect health outcomes, likely differ across employment types. For example, child health in formal sector households would be better if more educated parents who tend to have better knowledge for child health are concentrated in formal sector. Second, some unobserved characteristics such as preference or tendency that affect sector assignment may affect health outcomes. For example, if less risk averse parents tend to be self employed, the health outcomes can be different for them. Third, there are intrinsic differences across employment types, not captured by observable characteristics nor



unobserved tendency, that may affect health outcomes. Examples include availability of social insurance, access to knowledge, and social network for informal safety net.

In order to address the first two issues, and to draw some implications on the third point, I use a selectivity correction model. This approach takes the choice into each different type of employment as endogenous and addresses a selection bias. Following suggestions by Lee (1983) and Bourguignon (2004), I estimate outcomes with two steps.<sup>24</sup> The first step is a multinomial logit regression that estimates the probability of selection into each employment type. Then the second step is to estimate outcomes with self selection corrected term based on the earlier estimated probability of selection.

### Multinomial Logit

A worker is observed to be in one of the four mutually exclusive employment types as shown above: wage employment with pension and health insurance ( $H$ ), wage employment with pension only ( $P$ ), wage employment without pension or health insurance ( $N$ ), and self employment ( $S$ ). Let  $Y_{ij}$  denote the unobserved propensity for an individual  $i$  to hold  $j$  type of employment, which is determined by worker and market characteristics. The individual is assigned to be in the type which gives the highest value for the unobserved propensity. This means that

$$(1) \quad T_i = \begin{cases} H, & \text{if } Y_{iH} = \max (Y_{iH}, Y_{iP}, Y_{iN}, Y_{iS}) \\ P, & \text{if } Y_{iP} = \max (Y_{iH}, Y_{iP}, Y_{iN}, Y_{iS}) \\ N, & \text{if } Y_{iN} = \max (Y_{iH}, Y_{iP}, Y_{iN}, Y_{iS}) \\ S, & \text{if } Y_{iS} = \max (Y_{iH}, Y_{iP}, Y_{iN}, Y_{iS}) \end{cases}$$

where  $T_i$  is an actual type of employment that  $i$  was assigned.

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<sup>24</sup> Starting from Heckman (1979), studies have suggested econometric techniques to address selectivity bias. Lee (1983) and Dubin and McFadden (1984) provided selectivity bias correction methods, and recently, Bourguignon (2004) reviewed all of these approaches using Monte Carlo simulation. This paper uses methodology based on Lee (1983) due to its simplicity despite somewhat restrictive assumptions.

Let  $Y_{ij}$  be specified as a linear function of observable characteristics ( $X_i$ ) and unobservable random errors following a standard normal distribution conditional on  $X_i$ . Then,  $Y_{ij} = \Pi_j'X_i + \epsilon_{ij}$  and the standard multinomial logit yields

$$(2) \quad \Pr(T = j) = \frac{\exp(\Pi_j'X)}{\sum_j \exp(\Pi_j'X)} \text{ with } j=H, P, N, \text{ and } S.$$

Using the informal wage employment ( $N$ ) as a base category, the multinomial logit was estimated. Worker's characteristics including age, education, and marital status, and governorates dummy capturing local characteristics including labor market conditions are added. Subsamples of locality of residence and employment status are also considered.

Table 3 reports the results from multinomial logit estimation. As the informal wage employment is the base category, the estimates read the relative propensity of working in other types of employment rather than informal wage employment. Age, marriage, and education are positively associated with formal employment. That is, older and better educated workers are significantly more likely to work in formal sector than informal. The effects of some variables are heterogeneous across urban and rural areas. In urban areas, secondary education and above is negatively related to self employment rather than informal wage employment, and being a household head and having a pensioner in the household are significantly related to formal sector working. Also, being born at current village is negatively related to the informal wage employment, implying that those who lack local network may tend to work in informal wage employed jobs. In rural areas, however, those with secondary and above education and social network by being born in the same locality tend to work in self employment rather than informal wage employment.

The coefficients of each estimation, taken together and examined with the likelihood ratio test, shows significant differences from zero for both urban and rural areas. This indicates an overall non random sector assignment. In order to examine if sector assignment even within formal, between  $H$  and  $P$  is statistically different across observable characteristics, the null hypothesis that difference in

the coefficients of columns (1) and (2) is zero is tested. For urban areas, the Chi Square value is 15.8 and the null hypothesis is rejected only at 10% level whereas, in rural areas, the Chi Square value is 26.5 and the null hypothesis is rejected at 1% level. This implies that assignment between each type of employment including  $H$  and  $P$  is also nonrandom, although workers in  $H$  and  $P$  in urban areas are almost identical.

### Selectivity Corrected Outcomes

Let the outcomes ( $O_{ij}$ ) such as wage and health be determined jointly with sector assignment and a function of observable characteristics ( $Z$ ). Then  $O_{ij} = \beta_j'Z_i + \varepsilon_{ij}$ , where  $j=H, P, N$ , and  $S$ . Taking conditional expectation over all individuals on sector assignment yields  $E(O_j|T = j) = \beta_j'Z + E(\varepsilon_j|T = j)$ . Selectivity into each type of employment implies that  $E(\varepsilon_j|T = j) \neq 0$  and the Ordinary Least Squares (OLS) estimate is not consistent. Following Bourguignon (2004), Lee (1983), and Gindling (1991), the selectivity corrected model is estimated as

$$(3) \quad O_j = \beta_j'Z + \gamma_j\lambda_j + v_j, \text{ where } \lambda_j = \frac{\phi(\Phi^{-1}(\Pr(T=j)))}{\Pr(T=j)}^{25}$$

In this case, the standard errors should be corrected in order to factor in the unobserved selectivity. Using a Bootstrapping method with generating  $\lambda_j$  for 50 times, the corrected standard errors are obtained. Also note that variables affecting sector selection ( $X$ ) should include some variables that are not included in the second stage characteristics ( $Z$ ). The variables that affect the first stage selection, but not the second stage outcomes, include an indicator of being a household head, having a pensioner in the household, and being born in the current village.

The focus here is then to examine whether outcomes differ by employment types and how much is attributable to observable characteristics and selectivity. A series of exercises provide some insights on this. In order to examine the presence of selectivity, we first note the statistical

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<sup>25</sup> Note that  $\phi$  and  $\Phi$  denote probability density and cumulative distribution function of standard normal distribution.

significance of selection correction term ( $\lambda_j$ ). While the likelihood ratio test from the first stage multinomial logit regression provides the information on randomness of assignment to each type, the statistical significance of selectivity shows whether the assignment to each type affects the outcomes. Then comparing coefficients ( $\beta_j$ ) of observed characteristics across  $j$  would reveal the existence of segmentation, where observationally identical individuals may have different outcomes even after factoring in the unobservable heterogeneity. A decomposition exercise may inform where the difference in predicted values of outcome stems from: intrinsic difference across employment type, observable differences among workers, and selectivity. From equation (3), using Oaxaca decomposition and taking differences of mean values of outcomes for  $P$  and  $N$ , for example, yields:

$$(4) \quad \overline{O_P} - \overline{O_N} = \hat{\beta}'_N(\overline{Z_P} - \overline{Z_N}) + (\hat{\beta}_P - \hat{\beta}_N)' \overline{Z_P} + (\hat{\gamma}_P \overline{\lambda_P} - \hat{\gamma}_N \overline{\lambda_N})$$

$$(5) \quad = \underbrace{\hat{\beta}'_P(\overline{Z_P} - \overline{Z_N})}_{(1)} + \underbrace{(\hat{\beta}_P - \hat{\beta}_N)' \overline{Z_N}}_{(2)} + \underbrace{(\hat{\gamma}_P \overline{\lambda_P} - \hat{\gamma}_N \overline{\lambda_N})}_{(3)}.^{26}$$

The first term (①) reflects the differences in observable characteristics, the second term (②) captures differential effects of the same observable characteristics, and the third term (③) reflects the discrepancy attributable to unobserved heterogeneity and selection. The second and third parts together reflect outcome differences not explained by observational differences. Averaging out equations (4) and (5) yields an average path for decomposition. Finally, predicted values based on the estimation would provide useful information on group disparities. The  $t$  test of differences informs statistical significance of outcomes. Predicted outcomes at average characteristics also will inform how outcomes may vary for observationally identical individuals.

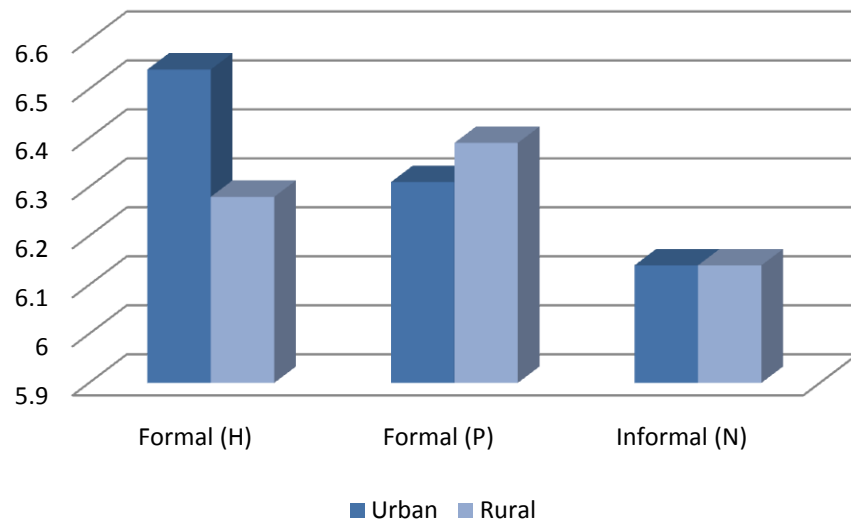
To begin with, I examine worker's wage rate, defined as earnings divided by hours of work, using the selectivity corrected model.<sup>27</sup> Table 4 presents the results from wage estimation among the

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<sup>26</sup> See Oaxaca (1973).

wage employed including  $H$ ,  $P$ , and  $N$ . Wage rates increase with one's age and education across all types of employment in urban areas, but the returns to additional education level are largest for  $H$  and smallest for  $N$ . A pair-wise comparison shows that the returns to age in rural areas are smaller than in urban areas, whereas the returns to education are larger in rural areas than urban areas, probably due to the limited supply of skilled workers. The occupation specific skills, measured with the job duration at the current work, have significant impacts on wage rates at decreasing rate, although urban  $P$  shows little distinctive patterns regarding the job duration and wages. The coefficients of selection are significantly different from zero only for urban  $H$  although selection into each sector is nonrandom, suggesting mild impacts of selection on wage rates. The predicted wage rates of each employment type by region (Figure 2) shows significantly higher rates among formal workers relative to informal wage employed, especially formal  $H$  workers.

Figure 2. Predicted Wage Rates:  
by employment status and region



<sup>27</sup> Unfortunately, the earnings information is not available for the self employed, and only the formal and informal wage workers are used for this estimation.

The  $t$  test indicates that there are significant differences in wage rates between  $H$ ,  $P$ , and  $N$  in urban areas, whereas the wage rates of  $H$  and  $P$ , significantly higher than  $N$ , are not statistically different from each other in rural areas. Finally, the decomposition exercise confirms that a significant proportion of the discrepancy in wage rates between groups is not explained by observable characteristics. For example, the wage rates of  $H$  and  $P$  in urban areas are higher than  $N$  by 0.39 and 0.26, and the parts due to observed characteristics are 0.47 and 0.18, respectively. Meanwhile, in rural areas, the wage rates differences in  $H$  and  $P$  relative to  $N$  is 0.13 and 0.18, and the parts due to observed characteristics are 0.32 and 0.30, respectively. This suggests that wage rates among  $H$  in urban areas, and both  $H$  and  $P$  in rural areas may be discounted due to some unobserved non wage benefits. However, a caution is needed to interpret these results, as the category of informal self employed is omitted due to limited information on wage rates.

## **6. Health, Access to Care, and Expenditure Differ by Employment Type**

In this section, I investigate whether the health related outcomes of interest vary by employment status of men in the households in line with the above presented methodology. When outcomes of interest are children, mother's characteristics such as their age, education, and some behavioral patterns including breastfeeding and smoking and qat chewing are added as well as household conditions. Likewise, women's and households characteristics are respectively added depending on the outcomes of interest. In each case, the selection into each employment type is determined by primary men's characteristics – father, husband, or household head.<sup>28</sup>

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<sup>28</sup> In all estimations,  $Z$  is a subset of  $X$ , where  $X$  determines the selection into each type of employment. Some of the variables in  $Z$  such as child's age and mothers' education, are added as well to  $X$  to make it a subset of  $X$  although those variables may not directly affect men's selection into each type of employment.

### Children's Nutrition and Health

Selectivity corrected estimation of severe stunting in urban and rural areas show several consistent patterns (Tables 5-6). Mothers' age and education, if not monotonically, reduce the likelihood of stunting. The number of children under six is strongly associated with stunting, suggesting resource (food and nutrients) constraints as main factor in child's malnutrition. The positive impacts of higher income in reducing child stunting is particularly clear among urban self employed families, although the relationship is unclear in rural areas. Mothers' behavior of smoking and qat chewing, and breastfeeding has significant impacts on child's stunting, more evident in rural than urban areas. Among the variables of water supply and quality conditions, water supply inside households without the need to fetch, and treated water can significantly reduce stunting. The findings confirm the importance of healthy behavior to promote healthy outcomes. Finally, the coefficients of selectivity are statistically significant for some employment types, indicating a mild effect of selectivity on child's nutrition.

Similar results are found for child's underweight, another indicator of nutrition, and child's health captured by the indicator of illness.<sup>29</sup> The effects of water supply and quality are strongly associated with both underweight and illness. This reconfirms the importance of water supply and quality conditions. Mothers' behavior seems to have important consequences for both child's health and nutrition. Mother's smoking and qat chewing is more closely related with child's illness than nutrition, whereas breastfeeding is more closely related with child's nutrition than illness. As they show similar results, I report the findings based on child's stunting.

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<sup>29</sup> The results for severe underweight and illness were not presented here, as they are similar to those of severe stunting.

## Women's Health

Women's illness is an indicator of chronic and non-chronic disease, illness, and accidents, and the estimation results for urban and rural areas are presented in Tables 7 and 8, respectively. In both areas, the likelihood of illness increases with women's age. No distinctive pattern emerges regarding the effects of educational attainment on health, although educated group relative to no education one tends to have slightly better outcomes. Women's risky behavior and living conditions, which are important factors in child's outcomes as shown above, also have strong impacts on the likelihood of women's illness. That is smoking and qat chewing increases the likelihood of illness, whereas better water supply and quality reduces illness. Number of children under six is negatively associated with women's illness. Mothers with young children are probably more health conscious and careful not to fall ill. Alternatively, healthier women may have higher parity as well as low infant fatality. Selectivity is statistically significant for some employment types.

No strong relationship exists between household income and health indicators, suggesting no better health outcomes among well off households. Instead, the estimation reveals the somewhat counterintuitive finding that women's illness is often more prevalent among the highest income quintile. Although puzzling, this finding can be explained if higher income women have better access to medical service and thus able to learn about their illness. This may suggest the limitation of self reported health measures and the importance of objective measures such as the ones based on BMI (Body Mass Index) or more objective self reported measures.<sup>30</sup>

## Health Outcomes by Employment Type and Region

The group comparisons of outcomes presented in Table 9 show significant differences between formal and informal households. The predicted probabilities of child stunting and women's illness by

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<sup>30</sup> The limitations of subjective self reported health measures in assessing physical capacity are widely recognized. For review of health measures, see Currie and Madrain (1999).



employment type show more prevalent malnutrition and poor health among informal than formal households (Panel A, row (1)). When predicted based on each type's own characteristics, in urban areas, the probabilities of stunting ranges from 28 to 32 percent among informal households, while those among formal households are significantly lower by 2 to 7 percentage points. Within formal households, the difference between  $H$  and  $P$  is somewhat muted, and so is the difference between  $N$  and  $S$  within informal households.

The probability of stunting at each type households for an average child also suggests better outcomes among formal than informal (Panel A, row (2)). For example, for 48 percent of children the probability of stunting in household  $H$  is lower than the predicted probability in other types of households. For only 36 percent of children the probability of stunting in household  $N$  is lower than the predicted probabilities in other types of households. Although both findings show consistent story about better outcomes among formal than informal, there are slight discrepancy in terms of within sector differences. Among formal households,  $H$  seems to be better off than  $P$ , and among informal households,  $S$  seems to be better off than  $N$  especially for women's illness. The slightly different results between the one based on each type's characteristics and the other based on the average characteristics suggest that there exist some differences pertaining to each type that engender differential outcomes for observationally identical individuals.

Finally, the  $t$  test results reconfirm that the group disparities are statistically significant, and a large part of the discrepancy is due to the characteristics pertaining to the job rather than the differences in individuals' characteristics (the Oaxaca decomposition). The bottom panel of column (2) shows, for example, that the likelihood of women's illness would be higher among all of  $H$ ,  $P$ , and  $S$  than  $N$ , if the individuals' observable characteristics are the only difference across all the types. However, due to the type specific effects of the observable characteristics (column (3)) and unobservable heterogeneity (column (4)),  $P$  gets lower predicted illness than  $N$ , suggesting  $P$  has the

job specific features that have positive influence on outcomes. The decomposition results show that there exists a large group disparity even for observationally identical individuals.

## **7. Accessibility and Affordability of Health Service**

Having found significant group disparities even among observationally identical individuals, this section discusses underlying factors that are likely related to the differential health outcomes across different types. In particular, we consider accessibility and affordability of health service as mentioned above. Accessibility to care is measured by an indicator of receiving medical help of women, assisted delivery, and child immunization, and affordability is measured with a few variables regarding health expenditure.

### Access to Care

Throughout all outcomes and regions, the findings on the determinants of access to service are consistent. It is positively associated with education, household income, and the presence of disabled household member (See Table 10 for the results for indicator of medical help). The relationship of access to service to education and income are not always monotonic. That is those with some primary education are not always better off than those with no education. However, in general, those with primary and above and 4<sup>th</sup> and 5<sup>th</sup> income quintiles are better off than their less educated and lower income counterparts. A significantly positive effect of the presence of disabled household member in access to care reflects the information impacts, as such households would have likely already experienced medical help or lack of it. The number of children under six shows negative effect, reflecting limited mobility among mothers with young children. Finally, some of selectivity measures

show statistical significance in both regions, indicating the nonrandom assignment to each employment type significantly affects outcomes.<sup>31</sup>

Group disparities confirms better access to service in urban than rural areas, and among formal, especially those with health insurance, than informal households (Table 11). Access to service measured with the indicators of medical help, assisted delivery, and child immunization all show consistent findings. In urban areas, it appears that the formal households with health insurance have clearly better access to health service than any other households. When predicted at average individuals with average characteristics (Panel B), the probability that the best outcome is observed at formal households  $H$  is the highest, suggesting that seemingly identical individuals would have better access to service in households  $H$ . In rural areas, the results are more mixed than those in urban areas.

### Health Expenditure

As noted earlier, health expenditure occurs mainly to the relatively well off households that can afford to pay for health service and those with severe illness. Among the households with positive expenditure on health, Table 12 presents the results of the share of health spending out of total household expenditure. The share is lower for the more educated and higher income households than the less educated and lower income counterparts. The share is negatively related with smoking and qat behavior, suggesting that those less risk averse in health tend to spend less on health. The presence of disabled household member largely increases the share of health spending. The increase in the share is as high as 31 percent among urban informal wage workers ( $N$ ), and 77 percent among rural formal health insured workers though statistically not significant.

Figures 3 and 4 depict the distribution of this share by region. In urban areas, informal households tend to spend slightly higher proportion of their consumption on health, although the

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<sup>31</sup> Note that the results for assisted delivery and child immunization are not presented here, as the findings convey similar results.

difference seems to be marginal (Figure 3). Formal households, both *H* and *P*, have thicker distribution at lower value than informal households. In rural areas, formal households face less variance in the proportion of health spending than the informal households (Figure 4). The health expenditure is more widely spread out among informal households, whereas formal households, especially those with health insurance, is more condensed around 8 percent (log value=-2.5) of household consumption.

The likelihood of catastrophic expenditure, if defined one when more than 14 percent of household consumption is spent on health, is higher among informal households than formal households.<sup>32</sup> However, there is virtually no difference in the density of those who spend more than half of household consumption on health. Note though that selection into positive spending on health is not accounted, and care is needed to interpret these figures.

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<sup>32</sup> The proportion of health expenditure is 14 percent of total household consumption when the log value is -2.

Figure 3. Proportion of health spending: Urban areas

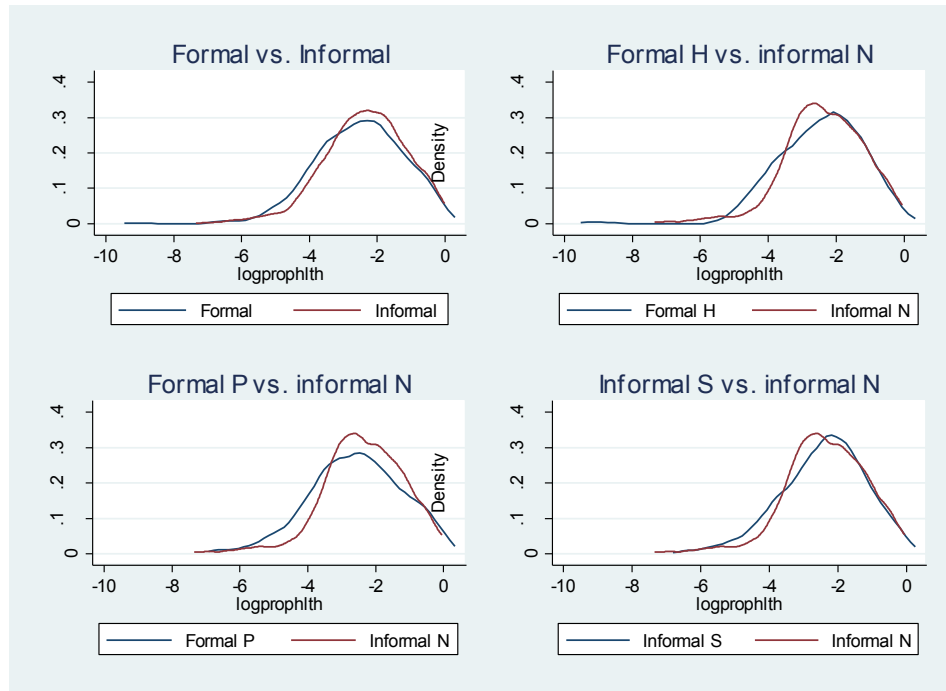
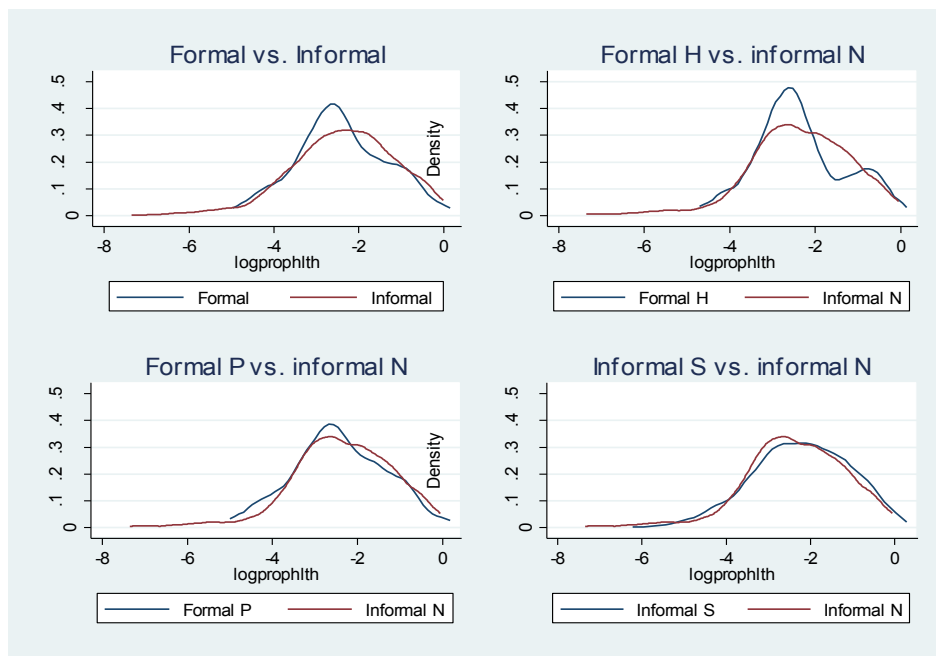


Figure 4. Proportion of health spending: Rural areas



## 8. Social Assistance and Informal Safety Net

Nonlabor transfers including public transfers from government and public programs, private transfer from NGOs and religious groups and other types of income would serve as an informal safety net in the case of external shock. As shown earlier, a disabled household member is a distress factor in health expenditure especially for informal sector households (See Table 12). I examine to what extent extra nonlabor income, out of which the largest proportion is social assistance, reduces the financial burden associated with household member with disability and how it varies with household type.

Inter-temporal resource allocation – savings and loans– is a commonly used risk coping mechanism, when the above mentioned social assistance does not reach. Households often resort to informal sources such as friends and relatives (not residing together) rather than banks or money lenders to borrow money.<sup>33</sup> The likelihood of borrowing increases with the presence of a disabled household member. The question is again the extent to which the health shock increases the likelihood of borrowing, and how it varies with household types.

The coefficients of the indicator of disabled household member in the regressions on indicators of transfer and borrowing are presented in Table 13. In urban areas, disabled household member significantly increases the likelihood of transfer incomes among informal households by 6 percentage points. Borrowing also increases with the residence of disabled household member by 6 to 13 percentage points. The likelihood of borrowing in presence of disabled household member is the largest for the self employed (*S*). In rural areas, the likelihood of receiving transfer income due to disability is highest among formal pension covered households (*P*). The incidence of borrowing increases with disabled household member by 9 to 11 percentage points, and is slightly higher for informal households. This suggests that urban informal households rely more on both types of safety net including social assistance and borrowing in presence of large spending needs than the formal

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<sup>33</sup> Sources of the outstanding loan include relatives (30%), friends and neighbors (35%), and traders (29%).

households. In rural areas, on the other hand, the transfers are more available for the pension covered formal households, and the informal households rely primarily on borrowing.

## **9. Conclusion**

Like other developing countries and transition economies, the informal sector provides many Yemenis work opportunities and consists of a large proportion of the labor market. A substantial proportion of the wage employed and almost of all self-employed workers, not covered by any social insurance programs, are more than 70 percent of workers. About 52 percent of households do not have anyone working in the formal sector. These workers and their households are believed to be more vulnerable to various risks due to the limited access to social insurance among others. Health risks are one the most common risks faced by many individuals and households, and particularly so in Yemen where national health outcomes are known to lag behind.

This paper investigated the relationship between informality and health risks, noting that there is little empirical evidence of differential vulnerability to risks across employment types. I first outlined the main characteristics of workers by employment and coverage status. Findings show that formal wage workers, mostly public sector workers, tend to be substantially more educated, older, and more experienced. They generally fall on a higher income quintile, although their earnings are not significantly larger than those of informal wage workers. They are less likely to work in the agriculture sector, and more likely to receive regular payment and benefits. Formal wage employed households are more likely to have current pensioners, implying a high intergenerational correlation of public sector jobs. Among informal workers, self-employed workers are less educated than wage employed workers, but their income level is not lower. A large disparity in worker and household characteristics was found between urban and rural areas.

Health outcomes widely vary along the employment types, generally better for formal than informal households. Selection corrected model accounts for unobservable heterogeneity that affects

sector assignment in determining health related outcomes as well as observed characteristics. In most cases, unobserved heterogeneity significantly affects outcomes of interest, implying that omitting this would bias the estimates. Among observable characteristics, behavioral variables such as smoking and qat chewing and breastfeeding, and water supply and quality conditions play important roles in determining health. We found a large disparity in outcomes between urban and rural areas.

The persistent gap between formal and informal households, even after factoring in observable and unobservable differences in characteristics, suggests that factors related to each employment type may explain group disparities. The results on accessibility and affordability of health care show that formal households have better access to service with less financial burden, although only a mild effect of health insurance is found. In the presence of disabled workers, households face a significant increase in health spending, and they tend to rely on informal safety net such as transfers and borrowing.

Given a wide heterogeneity between formal and informal and even within those sectors, in their exposure to health risks, health outcomes, coping mechanism, and spending, and also their poverty, more research is needed to find a suitable protection scheme that combines risk pooling and saving for the poor. In the mean time, rather than providing protection through work, a general approach to promote better living conditions and healthy behavior would be appropriate to address widespread health and malnutrition problems. For example, child stunting and related diseases are preventable by early interventions including micronutrient fortification and education on breastfeeding practice (Cho and Rassas, 2009). As shown in the results, water supply and quality condition as well as mother's behavior are very important factors in health, and should be promoted regardless of employment status or availability of social insurance.



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**Table 1.**  
**Summary Statistics by Employment Type and Region**

	All				Urban				Rural			
	Formal		Informal		Formal		Informal		Formal		Informal	
	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)
Proportion	7.2%	18.0%	37.6%	37.3%	9.3%	22.6%	36.9%	31.2%	3.9%	11.2%	40.2%	44.7%
<b>A. Worker Characteristics</b>												
Urban	57.7%	45.2%	25.5%	19.8%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Age	40.0	38.5	39.4	47.6	41.7	41.0	39.6	45.5	37.8	36.4	39.3	48.2
Male	98.1%	98.6%	99.2%	98.4%	96.7%	96.9%	97.7%	98.3%	100.0%	100.0%	99.7%	98.4%
No schooling	15.5%	12.0%	50.9%	67.6%	12.4%	11.2%	33.8%	49.6%	19.8%	12.6%	56.6%	72.1%
Primary -	7.3%	6.4%	15.6%	10.1%	5.4%	6.4%	12.9%	14.7%	10.0%	6.5%	16.5%	8.9%
Secondary	26.0%	25.4%	20.0%	14.4%	20.3%	20.5%	24.9%	21.7%	33.8%	29.4%	18.3%	12.6%
Tertiary +	51.1%	56.2%	13.6%	7.9%	61.9%	61.9%	28.3%	14.0%	36.5%	51.6%	8.6%	6.4%
HH Size	7.0	7.2	7.0	8.3	6.8	6.8	6.5	8.0	7.2	7.5	7.2	8.4
N. Children	1.5	1.7	1.5	1.6	1.2	1.3	1.3	1.5	1.8	2.0	1.6	1.6
Born here	64.0%	73.4%	78.9%	84.7%	41.7%	48.9%	46.0%	53.3%	92.4%	95.3%	93.0%	93.0%
<b>B. Job Characteristics</b>												
Agriculture	1.2%	1.0%	29.9%	60.5%	1.0%	0.4%	7.0%	12.3%	1.6%	1.4%	38.5%	72.4%
N. jobs >1	18.7%	32.6%	34.5%	13.9%	11.2%	15.1%	10.5%	6.1%	28.9%	47.0%	43.4%	15.8%
Public sector	93.8%	98.8%	4.9%	.	91.8%	98.1%	9.4%	.	96.6%	99.4%	3.4%	.
Earnings (month,YR)	41,443	28,368	35,739	.	48,102	32,965	44,055	.	32,349	24,574	32,914	.
Hours per week	42.3	38.9	48.9	.	41.4	38.2	52.1	.	43.5	39.4	47.8	.
Paid leave	98.1%	98.1%	6.2%	.	96.6%	96.3%	15.5%	.	100.0%	99.5%	3.0%	.
Health Insurance	100.0%	0.0%	2.0%		100.0%	0.0%	5.2%		100.0%	0.0%	0.9%	
N. years of this job	13.7	12.8	9.2	.	14.8	14.6	8.2	.	12.3	11.3	9.6	.

(Continued on next page)

(Table 1. Continued)

	All				Urban				Rural			
	Formal		Informal		Formal		Informal		Formal		Informal	
	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)
<b>C. Household characteristics</b>												
Pensioner in HH	11.2%	9.0%	3.9%	4.1%	15.8%	13.3%	8.0%	5.6%	5.3%	5.2%	2.1%	3.7%
Enough Water	53.6%	63.0%	62.2%	65.2%	55.1%	68.1%	62.1%	65.5%	51.6%	58.5%	62.2%	65.2%
Water in HH	63.0%	58.2%	37.5%	40.6%	78.7%	85.5%	76.5%	78.2%	42.5%	33.8%	20.8%	30.6%
Water treated	25.0%	20.1%	14.5%	9.4%	41.3%	39.1%	38.7%	34.0%	3.6%	3.2%	4.1%	2.9%
Extra Income	152,262	164,523	92,284	168,438	223,798	209,313	142,680	306,896	69,061	128,900	75,090	133,825
(YR, %)	62.4%	65.1%	59.5%	65.8%	58.1%	63.7%	59.3%	66.5%	68.2%	66.2%	59.5%	65.6%
Quintile1	13.8%	12.1%	34.7%	28.0%	4.8%	5.9%	13.4%	12.2%	26.2%	17.3%	42.0%	31.9%
Quintile2	19.7%	18.6%	22.2%	21.1%	9.1%	9.1%	15.7%	16.6%	34.0%	26.4%	24.5%	22.3%
Quintile3	14.6%	21.2%	16.2%	19.8%	14.6%	16.7%	18.0%	18.9%	14.7%	24.9%	15.6%	20.0%
Quintile4	20.7%	23.2%	13.3%	16.2%	25.7%	25.2%	20.4%	22.4%	13.8%	21.5%	10.9%	14.7%
Quintile5	31.2%	24.9%	13.5%	14.8%	45.8%	43.0%	32.6%	29.9%	11.3%	9.9%	7.0%	11.1%

*Notes:* H denotes formal wage workers with health insurance as well as pension, P denotes formal wage workers with pension coverage only, N denotes informal wage workers without social insurance, and S denotes self employed workers without social insurance. Panel A through D present the summary statistics and proportions of workers, jobs, and households by employment type and residence.

**Table 2.**  
**Health, Access to Care, Expenditure by Household Type**

	All				Urban				Rural			
	Formal		Informal		Formal		Informal		Formal		Informal	
	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)	(H)	(P)	(N)	(S)
<u>A. Health outcomes</u>												
Women's illness	17.6%	17.2%	18.9%	15.6%	22.3%	20.1%	22.0%	22.3%	11.6%	14.9%	17.8%	13.9%
Children stunting	28.4%	26.5%	32.3%	35.7%	26.2%	22.6%	27.7%	32.5%	35.0%	35.5%	37.6%	39.4%
Children underweight	12.1%	9.0%	12.4%	14.3%	10.6%	8.7%	10.8%	13.5%	16.3%	9.9%	14.3%	15.2%
Children Illness	21.4%	21.4%	20.8%	19.7%	22.4%	23.5%	23.0%	22.4%	18.5%	16.7%	18.2%	16.7%
<u>B. Access to Service</u>												
Women's Assisted Delivery	42.3%	40.1%	30.0%	29.6%	61.4%	58.9%	52.4%	52.1%	20.1%	27.7%	22.5%	24.1%
Medical Help when ill	92.2%	87.3%	85.0%	85.8%	95.3%	89.9%	89.4%	89.8%	88.1%	85.3%	83.5%	84.8%
Children Immunization	54.0%	51.8%	41.0%	41.3%	60.1%	60.7%	55.5%	56.5%	48.6%	47.2%	36.9%	38.0%
<u>C. Health Expenditure</u>												
Log(per capita spending)	8.3	8.0	8.0	8.1	8.6	8.3	8.4	8.2	7.7	7.9	7.8	8.0
Share of health spending	15.9%	15.7%	17.3%	17.4%	15.8%	16.0%	16.9%	16.1%	16.1%	14.9%	17.7%	18.7%
Catastrophic 1	8.8%	10.3%	12.4%	12.1%	10.1%	8.5%	10.0%	9.4%	7.2%	11.6%	13.3%	12.8%
Catastrophic 2	4.9%	5.6%	7.2%	7.3%	5.5%	4.5%	5.8%	4.3%	4.2%	6.4%	7.7%	8.0%

*Notes:* Panel A presents the shares of women and children who are reported to be ill or malnourished. Women's illness is defined to be 1 if they report chronic or nonchronic disease, and sickness and accidents. Children's stunting and underweight are both indicators of severe symptoms when the standardized z-score based on Body Mass Index for each measure is below -3 Standard Deviations. Panel B presents 3 measures that capture access to health service. Assisted delivery is calculated among those women who have given birth. Medical help when ill is a self reported variable indicating the respondent can seek professional medical help when falling ill. Panel C shows health expenditure of each household. Share of health spending is the ratio of health expenditure out of total household expenditure and calculated among the families for whom health spending occurred. Catastrophic expenditure 1 and 2 are defined to be 1 when the household health expenditure exceeds 10 and 20 percent of total non-food consumption, respectively.



**Table 3.**  
**Multinomial Logit Estimates of Employment Type Assignment: Base category is informal wage employment (N)**

Employment type	Urban			Rural		
	(1) Formal (H)	(2) Formal (P)	(3) Self (S)	(4) Formal (H)	(5) Formal (P)	(6) Self (S)
Age	0.053*** (0.005)	0.047*** (0.004)	0.027*** (0.003)	0.046*** (0.009)	0.048*** (0.006)	0.046*** (0.003)
Married	0.311** (0.122)	0.525*** (0.087)	0.131* (0.069)	0.242 (0.205)	0.916*** (0.149)	-0.341*** (0.088)
Less than primary	0.916*** (0.193)	0.887*** (0.132)	0.025 (0.085)	1.240*** (0.314)	1.366*** (0.222)	0.052 (0.091)
Primary	1.636*** (0.156)	1.513*** (0.114)	-0.023 (0.078)	2.270*** (0.264)	2.601*** (0.191)	0.076 (0.090)
Secondary +	2.638*** (0.148)	2.722*** (0.110)	-0.186** (0.080)	3.298*** (0.272)	4.030*** (0.196)	0.405*** (0.103)
Household head	0.637*** (0.127)	0.416*** (0.091)	0.075 (0.077)	0.115 (0.207)	-0.040 (0.138)	-0.170* (0.091)
Household size	0.034*** (0.010)	0.033*** (0.007)	0.075*** (0.006)	-0.014 (0.018)	-0.003 (0.011)	0.036*** (0.007)
Pensioner in the HH	0.457*** (0.132)	0.317*** (0.104)	-0.144 (0.103)	0.261 (0.328)	0.194 (0.233)	0.264 (0.172)
Born here	0.223** (0.087)	0.234*** (0.064)	0.270*** (0.053)	-0.334 (0.273)	0.332 (0.209)	0.250** (0.117)
Constant	-6.194*** (0.296)	-5.032*** (0.215)	-2.052*** (0.161)	-4.892*** (0.525)	-6.019*** (0.392)	-1.680*** (0.196)
Governorate dummies		Yes			Yes	
Pseudo R squared		0.25			0.17	

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. The Pseudo R squared value for the estimation is 0.25 and 0.17 for urban and rural, respectively. Formal (H) denotes formal wage employed with pension and health insurance, Formal (P) denotes formal employed with pension coverage only, and Self (S) denotes self employment without any social insurance. Omitted category is the Informal (N) which denotes wage employment without social insurance coverage. The 21 governorate dummies are included in each equation.

**Table 4.**  
**Selectivity Corrected Estimation of Log (Hourly wage rate) among the Wage Employed**

	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)	
A. Urban	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.026***	0.003	0.018***	0.003	0.012***	0.002
Job duration	0.038**	0.015	-0.003	0.009	0.033***	0.008
Duration squared	-0.001**	0.000	0.000	0.000	-0.001***	0.000
Primary	0.284**	0.120	0.172***	0.066	0.109**	0.054
Secondary	0.546***	0.115	0.378***	0.077	0.145***	0.054
Tertiary+	0.977***	0.142	0.631***	0.114	0.340***	0.085
Agriculture	0.770**	0.201	-0.515	0.551	-0.064	0.074
$\lambda_j$	-0.376**	0.176	0.166	0.130	-0.105	0.101
Constant	2.243	1.492	7.045***	1.335	5.207***	0.310
B. Rural						
Age	0.011*	0.006	0.015***	0.004	0.009***	0.002
Job duration	0.074***	0.024	0.026*	0.014	0.016***	0.006
Duration squared	-0.002**	0.001	-0.001	0.000	-0.000**	0.000
Primary	0.219	0.165	0.167	0.107	0.008	0.040
Secondary	0.466***	0.144	0.473***	0.119	0.131***	0.040
Tertiary+	0.755***	0.172	0.770***	0.161	0.262***	0.075
Agriculture	-0.238	0.567	-0.163	0.341	0.383***	0.048
$\lambda_j$	-0.316	0.200	-0.077	0.115	0.019	0.078
Constant	4.851***	1.612	5.087***	1.007	4.908***	0.326

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. In all estimation, governorate dummy variables are included. Job duration indicates the duration of work experience at the current job. The first stage multinomial logit estimation, though not exactly identical due to omission of the self employed, is similar to the results in table 3 and not shown here.

**Table 5.**  
**Selectivity Corrected Estimation of Child's Severe Stunting in Urban Areas**

Children <6	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Child's age	0.030***	0.009	0.011*	0.006	0.012**	0.004	0.023***	0.005
Age	-0.001	0.004	-0.003	0.002	-0.000	0.002	-0.005***	0.001
Less than primary	-0.054	0.073	-0.082***	0.027	0.017	0.037	-0.027	0.022
Primary	-0.111**	0.051	-0.071**	0.035	-0.010	0.035	-0.032	0.032
Secondary +	-0.091***	0.019	-0.037	0.027	-0.073***	0.021	-0.030	0.038
Number of children<=5	0.011	0.022	0.011***	0.003	0.017***	0.004	-0.004	0.006
Quintile2	0.038	0.067	0.002	0.035	-0.039	0.046	-0.126***	0.032
Quintile3	0.042	0.069	0.003	0.046	0.001	0.057	-0.107***	0.038
Quintile4	0.025	0.028	-0.018	0.039	-0.079	0.053	-0.132***	0.037
Quintile5	0.076	0.064	-0.067***	0.021	-0.057	0.054	-0.177***	0.037
Smoking/ qat chewing	0.004	0.093	0.002	0.024	-0.010	0.044	-0.035	0.035
Breastfeeding	-0.144**	0.076	0.035	0.071	0.069	0.117	0.028	0.118
Enough Water	0.001	0.050	0.018	0.038	0.023	0.014	0.046**	0.017
Water supply inside house	-0.028	0.046	-0.054	0.045	-0.026	0.047	0.012	0.019
Water treated	-0.062**	0.031	-0.046**	0.023	-0.059	0.044	0.017	0.031
$\lambda_j$	-0.057	0.083	-0.007	0.025	0.109**	0.042	0.092**	0.036
Constant	-0.183	0.534	0.043	0.569	0.206	0.128	0.363*	0.208

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here. In all estimation, governorate dummies are included.

**Table 6.**  
**Selectivity Corrected Estimation of Child's Severe Stunting in Rural Areas**

Children <6	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Child's age	0.023	0.025	0.005	0.011	0.012***	0.004	0.020***	0.008
Age	-0.011**	0.005	-0.006**	0.003	0.001	0.001	-0.002	0.001
Less than primary	0.015	0.049	-0.031	0.058	0.060	0.043	-0.039	0.065
Primary	-0.136	0.177	-0.019	0.075	0.011	0.054	-0.079***	0.022
Secondary +	-0.025	0.574	-0.138**	0.064	0.172	0.155	0.034	0.143
Number of children<=5	0.067**	0.036	-0.004	0.013	0.013**	0.005	0.018**	0.008
Quintile2	-0.058	0.123	0.043	0.035	-0.026	0.036	0.025	0.043
Quintile3	0.179***	0.036	-0.069***	0.025	-0.008	0.050	-0.024	0.050
Quintile4	0.032	0.232	-0.053	0.040	0.032	0.054	0.010	0.033
Quintile5	0.119	0.253	-0.049	0.038	-0.041	0.077	0.037*	0.018
Smoking/ qat chewing	0.259**	0.095	0.123***	0.045	0.022	0.041	0.034	0.038
Breastfeeding	-0.145	0.249	-0.360***	0.047	-0.082	0.122	-0.271*	0.138
Enough Water	-0.012	0.149	0.049	0.031	0.009	0.034	-0.039**	0.017
Water supply inside house	-0.147**	0.054	-0.101**	0.044	0.034**	0.016	-0.024	0.039
Water treated	-0.094	0.224	-0.096	0.121	-0.064	0.067	-0.239***	0.045
$\lambda_j$	0.195**	0.089	0.081	0.056	0.075	0.060	-0.084***	0.015
Constant	1.594***	0.141	0.296**	0.117	0.650**	0.250	0.043	0.153

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here.

**Table 7.**  
**Selectivity Corrected Estimation of Women's illness in Urban Areas**

Married Women	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.006**	0.003	0.004***	0.001	0.009***	0.001	0.005***	0.001
Primary	0.110**	0.050	-0.011	0.016	0.053*	0.030	-0.008	0.012
Secondary	0.014	0.050	-0.042***	0.015	0.019	0.012	0.001	0.040
Tertiary +	-0.087	0.059	-0.054***	0.019	-0.012	0.023	-0.072***	0.021
Number of children<=5	0.001	0.008	-0.013**	0.005	-0.006	0.004	-0.011***	0.002
Quintile2	0.037	0.096	0.002	0.030	0.039	0.048	0.022	0.024
Quintile3	0.000	0.080	0.038	0.025	0.069	0.052	0.060***	0.021
Quintile4	0.070	0.106	0.032***	0.010	0.087	0.055	0.016	0.027
Quintile5	0.125*	0.071	0.071***	0.014	0.132***	0.038	0.078**	0.036
Smoking/ qat chewing	0.061	0.049	0.074***	0.024	0.084***	0.028	0.060***	0.014
Enough Water	-0.045**	0.019	-0.054**	0.025	-0.032	0.027	-0.028	0.020
Water supply inside house	-0.020	0.047	-0.051***	0.010	0.009	0.018	-0.033	0.021
Water treated	0.047	0.047	0.028	0.017	0.021	0.021	0.051**	0.022
$\lambda_j$	-0.098***	0.031	-0.003	0.037	0.107***	0.033	0.030	0.041
Constant	-0.176	0.526	0.272	0.438	-0.274	0.198	-0.161*	0.093

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here. See Table 3 for multinomial logit estimation of selection.

**Table 8.**  
**Selectivity Corrected Estimation of Women's illness in Rural Areas**

Married Women	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.002	0.003	-0.002	0.002	0.006***	0.001	0.006***	0.002
Primary	-0.104	0.203	-0.006	0.024	0.028	0.025	0.040**	0.020
Secondary	0.096	0.104	-0.100***	0.026	-0.003	0.042	-0.036	0.023
Tertiary +	-0.124	0.081	-0.064	0.046	0.002	0.049	0.021	0.072
Number of children<=5	0.002	0.016	-0.016***	0.004	-0.010**	0.004	-0.004	0.003
Quintile2	0.049	0.092	-0.028	0.018	-0.006	0.024	-0.031	0.020
Quintile3	0.077	0.093	0.029**	0.012	0.008	0.013	-0.003	0.013
Quintile4	-0.001	0.129	0.029	0.028	0.029	0.042	0.010	0.026
Quintile5	0.036	0.135	0.057	0.039	0.077**	0.034	0.027	0.060
Smoking/ qat chewing	0.172	0.189	-0.001	0.050	0.069***	0.026	0.040**	0.017
Enough Water	0.013	0.180	-0.022	0.045	0.031	0.021	-0.020	0.017
Water supply inside house	-0.135***	0.035	-0.018	0.045	-0.046**	0.025	-0.029**	0.011
Water treated	0.263	0.304	-0.016	0.077	0.009	0.020	-0.021	0.016
$\lambda_j$	0.224	0.148	-0.049***	0.012	-0.005	0.029	-0.057	0.064
Constant	0.599	0.470	0.000	0.074	0.101	0.104	0.407**	0.218

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here. See Table 3 for multinomial logit estimation of selection.

**Table 9.**  
**Group Comparison and Decompositions**

A. Group Comparison	Urban Areas				Rural Areas			
	Formal		Informal		Formal		Informal	
	H	P	N	S	H	P	N	S
(1) Predicted probability								
Child stunting	26.6%	24.4%	28.1%	31.6%	34.6%	32.2%	37.2%	36.7%
Woman's illness	21.1%	20.0%	20.7%	21.5%	12.3%	10.9%	15.9%	16.6%
(2) Proportion of the sample with the best outcome								
Child's stunting	48.2%	35.2%	36.1%	32.4%	52.5%	50.7%	24.4%	27.7%
Woman's illness	34.5%	32.1%	13.4%	31.3%	53.2%	22.5%	9.1%	21.7%
B. Decompositions	(1) $\bar{O}_i - \bar{O}_j$	(2) $\hat{\beta}_j'(\bar{Z}_i - \bar{Z}_j)$	(3) $(\hat{\beta}_i - \hat{\beta}_j)' \bar{Z}_i$	(4) $(\hat{\gamma}_i \bar{\lambda}_i - \hat{\gamma}_j \bar{\lambda}_j)$	(5) $\bar{O}_i - \bar{O}_j$	(6) $\hat{\beta}_j'(\bar{Z}_i - \bar{Z}_j)$	(7) $(\hat{\beta}_i - \hat{\beta}_j)' \bar{Z}_i$	(8) $(\hat{\gamma}_i \bar{\lambda}_i - \hat{\gamma}_j \bar{\lambda}_j)$
<u>Child stunting</u>								
H-N	-1.5**	-0.6	-19.9	19.0	-2.6	-7.4	30.4	-25.6
P-N	-3.5***	-1.8	-13.5	11.8	-5.0***	4.1	-6.7	-2.4
S-N	3.6***	2.4	-0.7	1.9	-0.4	4.1	-18.3	13.8
<u>Woman's illness</u>								
H-N	0.4	6.4	-31.0	25.0	-3.7**	-2.3	37.5	-38.9
P-N	-0.7**	2.8	-14.8	11.3	-5.0***	-1.6	-8.8	5.4
S-N	0.8**	4.1	-11.5	8.2	0.6**	5.5	-8.7	3.8

Note: \*\*\*, \*\*, and denote statistical significance at 1%, 5%, and 10% level, respectively, from the t test whether the estimate is significantly different from zero. Panel A shows predicted probability of child's stunting and women's illness at each type. Panel B shows t test results. The first t test (columns (1) and (3)) conducted for each type is the difference of mean of each probability. The second t test (columns (2) and (4)) shows difference in predicted probability measured at mean characteristics.

**Table 10.**  
**Selectivity Corrected Estimation of Access to Health Service**

	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
A. Urban	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.002	0.002	-0.001	0.001	0.001	0.001	0.000	0.000
Less than primary	0.047	0.029	-0.017	0.034	-0.010	0.028	0.012	0.018
Primary	0.025	0.020	0.073***	0.024	0.076***	0.018	0.080***	0.026
Secondary +	0.047	0.038	0.051***	0.019	0.063***	0.019	0.046	0.034
Number of children<=5	0.002	0.008	-0.025***	0.005	-0.016***	0.005	-0.013***	0.003
Quintile2	-0.005	0.034	0.002	0.043	-0.002	0.035	-0.024	0.029
Quintile3	0.003	0.032	0.040	0.056	0.005	0.033	-0.011	0.028
Quintile4	-0.025	0.044	0.081*	0.047	0.017	0.033	-0.030	0.027
Quintile5	-0.014	0.033	0.092**	0.044	0.061**	0.028	-0.021	0.027
Disabled member in the HH	0.025	0.022	0.052***	0.014	0.040*	0.021	0.030**	0.012
$\lambda_j$	-0.000	0.044	-0.078***	0.021	0.022	0.044	-0.013	0.037
Constant	0.895	0.086	0.747***	0.087	0.825***	0.061	0.849***	0.038
B. Rural	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.009	0.006	-0.006***	0.002	-0.002**	0.001	-0.004***	0.001
Less than primary	-0.199**	0.086	-0.198***	0.059	-0.038	0.033	0.004	0.047
Primary	0.090	0.089	0.051	0.041	0.072	0.048	0.110**	0.054
Secondary +	0.175**	0.088	-0.030	0.056	0.043	0.076	-0.227	0.181
Number of children<=5	-0.020	0.026	-0.019*	0.011	-0.022***	0.006	-0.019***	0.006
Quintile2	0.035	0.126	0.090*	0.049	0.025	0.020	0.091***	0.025
Quintile3	-0.047	0.130	0.111**	0.043	0.024	0.031	0.093**	0.036
Quintile4	0.298**	0.127	0.097**	0.043	-0.006	0.032	0.085***	0.032
Quintile5	0.087	0.154	0.179***	0.041	0.024	0.031	0.082**	0.036
Disabled member in the HH	0.117	0.110	0.037	0.036	0.018	0.022	0.048**	0.024
$\lambda_j$	0.456***	0.123	-0.047	0.041	-0.098***	0.044	0.204***	0.054
Constant	1.283***	0.340	0.928***	0.092	0.808	0.051	1.081***	0.092

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here.



**Table 11.**  
**Group Comparison in Access to Service**

	Urban Areas				Rural Areas			
	Formal		Informal		Formal		Informal	
	H	P	N	S	H	P	N	S
A. Predicted probability								
Medical Help	94.8%	84.0%	83.8%	84.4%	86.3%	83.2%	80.5%	81.2%
Assisted Delivery	56.9%	52.5%	50.5%	47.2%	26.4%	28.8%	23.6%	25.5%
Child immunization	57.9%	59.5%	53.7%	54.2%	48.3%	47.0%	40.1%	41.0%
B. Proportion of the sample with the best outcome								
Medical Help	32.9%	22.1%	24.2%	32.1%	39.5%	32.5%	20.5%	14.0%
Assisted Delivery	35.1%	25.0%	26.1%	25.1%	26.5%	43.9%	16.3%	19.9%
Child immunization	47.9%	33.5%	31.1%	39.4%	65.8%	33.6%	26.6%	29.3%

Notes: Medical help indicates access to medical professional in case of illness. Assisted delivery is calculated among mothers who received medical assistance in child birth. The indicator of child immunization indicates whether the child received all five immunizations. Panel A presents the probability of each indicator to be one predicted based on each type's characteristics after estimation. Panel B is based on probabilities calculated based on the average characteristics across all types. The numbers in panel B presents the proportion of the sample indicating the outcome of the type of interest is better than those of others.

**Table 12.**  
**Selectivity Corrected Estimation of Log (Proportion of Health Expenditure)**

	(1) Formal (H)		(2) Formal (P)		(3) Informal (N)		(4) Self (S)	
A. Urban	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	0.045	0.095	0.044	0.042	-0.000	0.020	0.013	0.018
Age Squared	-0.001	0.001	-0.000	0.001	-0.000	0.000	-0.000	0.000
Less than primary	-0.399	0.771	-0.266	0.642	-0.220	0.152	-0.057	0.184
Primary	-0.564	0.539	0.483	0.590	-0.350**	0.143	-0.204	0.158
Secondary +	-1.028**	0.492	0.391	0.671	-0.433**	0.196	-0.326	0.214
Smoking/ qat chewing	-0.205	0.227	-0.401**	0.171	0.148	0.101	0.134	0.132
Quintile2	-0.298	0.535	-0.119	0.495	-0.169	0.145	-0.425**	0.171
Quintile3	-0.116	0.432	-0.049	0.485	-0.348**	0.136	-0.541***	0.161
Quintile4	-0.160	0.426	0.124	0.496	-0.277**	0.121	-0.493***	0.152
Quintile5	-0.586	0.403	-0.058	0.515	-0.412***	0.140	-0.669***	0.176
Disabled member in the HH	0.098	0.188	0.296*	0.176	0.311***	0.094	0.247***	0.093
$\lambda_j$	1.250**	0.610	-0.521	0.462	0.004	0.263	-0.030	0.171
Constant	-0.010	1.997	-4.424***	1.430	-1.810***	0.407	-2.290***	0.366
B. Rural	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
Age	-0.013	0.191	-0.099	0.074	-0.011	0.021	0.004	0.013
Age Squared	0.001	0.003	0.001	0.001	-0.000	0.000	-0.000	0.000
Less than primary	1.368	0.805	-0.520	0.523	-0.193	0.125	-0.023	0.149
Primary	0.895	0.864	-0.372	0.613	-0.289**	0.143	-0.067	0.178
Secondary +	1.145	0.975	-0.172	0.764	-0.418**	0.223	-0.286	0.174
Smoking/ qat chewing	-0.121	0.856	0.185	0.287	-0.276***	0.099	-0.060	0.123
Quintile2	0.038	0.615	-0.313	0.432	-0.353***	0.110	-0.348***	0.121
Quintile3	0.153	0.630	-0.524	0.405	-0.544***	0.122	-0.391***	0.126
Quintile4	-1.302	0.681	-0.003	0.462	-0.423***	0.142	-0.301**	0.139
Quintile5	-0.846	0.722	-0.280	0.484	-0.504***	0.158	-0.638***	0.219
Disabled member in the HH	0.771	0.656	0.227	0.227	0.149*	0.089	0.311***	0.098
$\lambda_j$	0.469	0.934	-0.283	0.452	-0.238	0.220	-0.290	0.257
Constant	-2.985	4.204	-0.561	1.915	-1.301***	0.387	-2.392***	0.316

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Standard Errors are obtained from bootstrapping. Omitted categories are “no education” and “Quintile 1.” The results of selection equation are not presented here. Governorate dummies are included in each estimation.

**Table 13.**  
**Informal Safety Net: The Impacts of Disabled Household Member**

Dependent variables	(1) Formal (H)		(2) Formal(P)		(3) Informal (N)		(4) Self (S)	
	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.	Coefficient	S.E.
A. Urban								
Transfer income	0.037	0.065	0.031	0.033	0.060**	0.032	0.040**	0.020
Borrowing	0.067***	0.023	0.093***	0.033	0.064**	0.032	0.128***	0.039
B. Rural								
Transfer income	-0.085	0.104	0.227***	0.031	0.059***	0.021	0.060**	0.026
Borrowing	0.018	0.085	0.092***	0.030	0.116***	0.045	0.113***	0.029

Notes: The coefficients of an indicator of disabled household member are obtained from two separate regressions on transfer income and borrowing separately for each region.